LOUDOUN COUNTY PUBLIC SCHOOLS

PLANNING AND LEGISLATIVE SERVICES
21000 Education Court
Ashburn, Virginia 20148
Telephone: 571-252-1050
Facsimile: 571-252-1101

July 16, 2008

Marchant Schneider
Department of Planning
County of Loudoun County
1 Harrison Street, S. E., 3rd Floor
Leesburg, VA 20177-7000

RE: SPEX 2008-0017 & CMPT 2008-0007
Loudoun County School Board – Lenah Property
Transportation Referral Responses

Dear Marchant:

On June 5, 2008, we met with County Transportation and VDOT staff to review the Lenah Property transportation referrals. As a result of both the referrals and the meeting, additional information was requested for the application review. Please find enclosed detailed responses to the transportation referral comments. We are providing ten copies for your use and distribution.

As you know, we would like to meet with the County and VDOT in early August to discuss the supplemental information and to answer any additional questions. We appreciate your coordinating a meeting date and look forward to working with you.

Copies of the referral responses will be posted on the LCPS web site for easy access by the public. If you have any questions or need additional information, please let me know. Thank you for your assistance in this matter.

Sincerely,

Sara Howard-O'Brien

Sara Howard-O'Brien, AICP
Land Management Supervisor

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JUL 16 2008
PLANNING DEPARTMENT

E-mail: lcpsplan@loudoun.k12.va.us
Web Site: www.loudoun.k12.va.us

A-115

GOROVE/SLADE ASSOCIATES, INC.
3914 Centreville Road / Suite 330 / Chantilly, VA 20151
Phone: 703-787-9595
Fax: 703-787-9905

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PLANNING DEPARTMENT

MEMORANDUM

TO: Marchant Schneider — Loudoun County
Art Smith — Loudoun County
George Phillips — Loudoun County

CC: Sara Howard-O'Brien — Loudoun County Public Schools
Sam Adamo — Loudoun County Public Schools

FROM: Christopher Tacinelli, P.E.
Tushar Awar, P.E.
Cody Francis, P.E. — Bowman Consulting Group

DATE: July 16, 2008

SUBJECT: Response to Comments for Traffic Impact Study - Loudoun County Public Schools Lenah Property MS-5 andHS-7; SPEX 2008-0017 and CMPT 2008-0007

This document addresses the comments from **Loudoun County OTS** for the traffic impact study prepared for Loudoun County Public Schools, Lenah Property MS-5 andHS-7; SPEX 2008-0017 and CMPT 2008-0007, Loudoun County, Virginia. Each comment is presented in *italics* with the response in **bold** immediately following.

COMMENTS:

1) *While a roundabout was considered by VDOT at the Route 50/Lenah Road intersection, funding has not been approved. Therefore, in order to facilitate safe travel on Route 50 and accommodate the anticipated site traffic turning onto Lenah Road from Route 50, intersection improvements are necessary. These could take the form of the roundabout or new left and right turn lanes. A traffic signal is shown to be needed. Currently, no funds are available for the design and installation of this signal.*

Loudoun County Public Schools (LCPS) recognizes the interest of all parties in addressing the existing traffic problem at Route 50 and Lenah Road. As discussed in our meeting on June 5, 2008, the level of service at this intersection is a problem today, and a signal is warranted without the school. School traffic is 12% of the total traffic at this intersection. Pursuant to your comments and as discussed in our meeting on June 5, 2008, LCPS has reviewed the existing available right-of-way and

explored several options for improvements at this intersection which are described below:

a. Provide a traffic signal at Route 50 and Lenah Road with widening to the north for a west bound left turn lane and to the south for an east-bound right turn lane: LCPS believes that the left turn lane and traffic signal could be constructed in the available right-of-way, but that that right turn lane would require additional right-of-way from the Skillman property at the southwest corner of the intersection. LCPS would need assistance from Loudoun County for right-of-way acquisition to construct these improvements within a specified timeframe. An extension of the bridge over Lenah Run may also be required depending on final design requirements of VDOT. This extension may not be necessary if VDOT is willing to either accept a 200' left turn lane with a 100' taper, or, accept a lane shift transition length greater than "½ L" but less than "L", (where L=WS). This transition would be less than the stated "L" requirement in the MUTCD, but greater than the " ½ L" requirement shown in the VDOT Work Area Protection Manual. Typically VDOT requires lane shifts in accordance with the MUTCD for permanent improvements.

b. Providing a traffic signal at Route 50 and Lenah Road with widening to the north for both a west bound left turn lane and an east-bound right turn lane: This scenario requires right-of-way dedication from the Kaya, LLC property at the northwest corner of the intersection, and will require the extension of the bridge over Lenah Run. As such LCPS believes this option requires Loudoun County assistance for right-of-way acquisition.

c. Providing a single lane roundabout at Route 50 and Lenah Road: While right-of-way width is available at the northeast corner of the intersection, this concept would appear to require right-of-way from the Kaya, LLC and Ned Manalu, LLC properties respectively at the northwest and southeast corners of the intersection to allow for transitions into the roundabout. As recommended by Supervisor Burton during a meeting on June 6, 2008, LCPS retained Mr. Michael Wallwork of Alternate Street Design, P.A. to prepare roundabout designs that would provide proper functionality while limiting right-of-way acquisition requirements. The results of these alignment studies are shown on the attached graphics and summary report. As stated in his report, no roundabout design can be accomplished without right-of-way

acquisition. LCPS would need assistance from Loudoun County to accomplish any proposed roundabout improvement.

d. Providing a double lane roundabout at Route 50 and Lenah Road: As discussed in our meeting on June 5, we believe this scenario is inappropriate because Route 50 only has a single lane in each direction. Based on preliminary design, this scenario would require right-of-way from the property owners at the northwest, southwest, and southeast corners of the intersection. Attached is a graphic showing preliminary roundabout design by Michael Wallwork for a two-lane roundabout, and illustrating the anticipated right-of-way requirements.

The options listed above are shown graphically in Appendix A attached at the back of this memorandum. In summary, the improvements at Route 50 and Lenah Road are necessary without the schools, and are regional in nature. LCPS would need assistance from Loudoun County to obtain right-of-way for most improvements. A westbound left turn lane and signal could be accommodated today in the existing right-of-way, and the traffic analysis indicates that this is the most appropriate improvement until such time as right-of-way is made available for a roundabout or other improvements. The benefits of this improvement are:

a. Minimal right-of-way acquisition is required
b. Acceptable LOS is achieved for the peak hour of generator
c. Construction and maintenance of traffic costs are minimized
d. Installation of the traffic signal does not preclude the installation of the roundabout. Response for comment # 9 elaborates on the comparison of a roundabout with a signal.

2) *At the present time, the proposed site is served by the unpaved Lenah Road south to Braddock Road. The traffic study notes that a majority of the over 4,900 daily vehicle trips will access the site to and from the south via Braddock Road. The applicant's traffic study also notes that Greenvest LLC is to provide a portion of the Lenah Loop Road between Braddock Road and the site as a two lane undivided road. The SBPL 2008-0002, Lenah, does show a new road, Lenah Village Drive, running along the planned Lenah Loop Road alignment and serving the schools. If this road segment is not in place, the applicant will need to provide this paved connection or investigate paving existing Lenah Road to the south.*

As discussed in our meeting on June 5, 2008, the LCPS contract with the property

owner requires the construction of the segment of Lenah Village Drive from Braddock Road to the southern school entrance on Lenah Village Drive, as depicted on the Special Exception plat, prior to the opening of the middle school. The segment of Lenah Village Drive between the school's southern entrance north to the existing Lenah Road, including the realignment of Lenah Road to create a "T" intersection, will be constructed in conjunction with the development of the residential subdivision and specifically within 14 calendar months from the sale and conveyance of the 350th lot to a third party builder. The pending Lenah subdivision (SBPL 2008-0002), proposes 499 lots.

3) *In order to facilitate the construction of the planned Lenah Loop Road along the eastern boundary of the site, the applicant needs to dedicate 35 feet of right of way along the full eastern property edge plus provide all necessary construction related easements including drainage, utility and grading easements. Additional right of way also needs to be dedicated to accommodate separate right and left turn lanes at the planned Lenah Loop Road/Tall Cedars Parkway intersection.*

As discussed in our meeting on June 5, the full 70' right-of-way and easement dedication is being proposed by Greenvest on the Lenah Preliminary Plat of Subdivision along this entire segment of roadway. LCPS agrees to provide additional right-of-way or easements for roadway widening, should that be necessary.

4) *In the event the applicants for the Lenah subdivision 2008-0002 do not construct the Lenah Loop Road, the applicant needs to provide construction of two paved lanes of the Lenah Loop Road along the frontage of their site which would include the realignment of the existing east-west portion of Lenah Road into the Lenah Loop Road. This also includes turn lanes at the proposed site entrance at future Tall Cedars Parkway. If the two lane on-site and off-site construction of the Lenah Connector is constructed by others south to Braddock Road, then the applicant should provide the other two lanes along their site frontage and two lanes north to Route 50.*

The LCPS contract for the purchase of this site provides for the construction of a two lane Lenah Village Drive from Braddock Road to the school entrance at the southeast corner of the site. There will also be a second point of access on existing Lenah Road, providing access to the site from Route 50. With these two points of access and the internal connecting street, the schools will be provided with more than adequate access. The segment of Lenah Village Drive from the southern school entrance to existing Lenah Road, including the realignment of Lenah Drive to create a T-intersection with Lenah Village Drive, is to be constructed in conjunction with the residential subdivision. The contractual timing of this segment is within 14 months of the transfer of the 350th residential lot to a third party builder. The

proposed subdivision seeks 499 lots. Ultimately, there will be two lanes of Lenah Village Drive from Braddock Road to Route 50. The additional two lanes for the planned four lane section of Lenah Village Drive between Tall Cedars Parkway and Route 50 would appropriately be provided when parties on the eastern frontage are re-developed. The traffic generated from the proposed school use does not warrant these additional two lanes.

5) *If not provided under SBPL 2008-0002, the applicant needs to provide two paved lanes along the full frontage of existing Lenah Road plus all VDOT required turn lanes at the proposed site entrances.*

As discussed in our meeting on June 5, 2008, we propose that two full paved lanes meeting current VDOT standards be constructed along the frontage of the site from the existing end of pavement to the end of the west school entrance to the school site, in lieu of providing half-section improvements along the entire frontage. As most of the traffic comes from either the southeast along Braddock Road and Lenah Village Drive, and from the north east along Route 50 and Lenah Road, LCPS believes this will provide adequate access to the site. Should the County require improvements beyond the school entrances, LCPS proposes to phase the improvements to allow adequate time for wetland permitting associated with construction west of the entrance. Based on the traffic study, no turn lanes are warranted at the entrances.

6) *The applicant needs to provide pedestrian/bike trail facilities parallel to existing Lenah Road and the Lenah Loop Road along the site frontage.*

LCPS has revised the SPEX plat to provide an 8' wide trail along existing Lenah Road. The trail along the Lenah Loop Road (aka Lenah Village Drive) will be constructed with Lenah Village Drive by Greenvest per our contract.

7) *The number of parking spaces shown on the concept plan seems high. What are the Ordinance parking requirements for the two schools combined? Please clarify. OTS defers to the Department of Building & Development of Building & Development on this possible issue.*

The parking areas depicted on the SPEX plat are consistent with other middle and high school locations and the number which experience has shown is needed. The Zoning Ordinance standards for school use are inadequate requiring 1 space per classroom plus .2 per student over driving age. The 1350 student middle school will have approximately 68 classrooms and the 1800 student high school will have

approximately 88 classrooms. There are approximately 140 middle school and 200 high school staff members. There is also a need for parking to accommodate visitors to the school. The proposed number of spaces for the middle school is approximately 165 and the proposed number of spaces for the high school is approximately 820. Events such as back to school nights, sporting competitions, award ceremonies, school plays, concerts and choral events, and similar activities warrant the provision of adequate parking. Older schools that were constructed with less parking have resulted in overflow to surrounding residential neighborhoods, which have caused conflicts in the past.

8) *A paved Lenah Road to the schools entrances and a paved Lenah Loop Road (Lenah Village Drive). Both improvements are shown as being constructed by Greenvest as part of SBPL 2008-0002. However, guarantees need to be in place to make sure the construction will occur in the appropriate timeframe.*

LCPS acknowledges the importance of providing paved access to the schools. As indicated above, paved access to the school entrances and construction of the Lenah Loop Road to the south entrance will be accomplished via contract with Greenvest, and via public improvements associated with the school construction.

9) *Intersection improvements at Route 50/Lenah Road. This would be either a roundabout, which OTS prefers, or turn lanes and a traffic signal. There is currently no funding for these improvements and the proposed fair share contributions by the applicant are inadequate.*

LCPS has rendered the services of Alternate Street Design, P.A. to evaluate the design options for the proposed roundabout at the intersection of Route 50 and Lenah Road. The report prepared by Alternate Street Design, P.A. is attached in Appendix B, and presents the following conclusions:

1. **A single lane roundabout does not operate under acceptable levels of service conditions. The single lane roundabout can handle existing traffic and traffic generated by the middle school, however it will fail with the addition of traffic generated by nearby approved developments and the High School.**
2. **The roundabout analysis for 2010 traffic projections shows that a two lane roundabout will operate under acceptable levels of service conditions, however widening of Route 50 to a four lane road will also be required.**

3. **The traffic study shows that with the installation of the traffic signal and the turn lane improvements under the 2011 conditions (existing traffic + background growth + middle school traffic + high school traffic), the intersection operates under acceptable levels of service conditions. Widening of Route 50 is not required under the traffic signal scenario.**

Comparing the installation of a roundabout with a traffic signal at the intersection of Route 50 and Lenah Road based on the factors shown in the table below reveals that installation of a traffic signal is a more favorable option considering the location of the intersection:

TRAFFIC SIGNAL VS ROUNDABOUT

Route 50 and Lenah Road	Traffic Signal	Roundabout
Capacity Analysis	☑	
Construction Cost	☑	
Required Right of Way	☑	
Maintenance of Traffic	☑	

☑ Favorable

I. <u>Capacity Analysis</u>: **The capacity analysis reveals that a single lane roundabout will operate at unacceptable levels of service conditions under future conditions (2011). Installation of a traffic signal at this intersection reveals that the intersection will operate under acceptable levels of service conditions for future conditions (2010 and 2011) with the addition of turn lane improvements and without the widening of Route 50. The applicant, Loudoun County Public Schools, has proposed to install the traffic signal and construct the westbound left turn lane at the intersection of Route 50 and Lenah Road. These improvements as shown in the traffic study are required under existing/background conditions and are needed regardless of the School traffic utilizing these intersections.**

II. <u>Construction Cost and Right of Way Acquisition Cost</u>: **As mentioned earlier, a double lane roundabout will require extensive right of way acquisition and involve higher construction costs as compared to a traffic signal.**

III. Maintenance of Traffic: **The major constraint involved in the construction of a roundabout is the construction of the inner circle. This process disrupts traffic flow for the main line. Route 50 being a heavy commuting corridor; it will require an extensive MOT plan to guide vehicles around the construction site. This could involve construction of a small loop road around the proposed roundabout location or enforcing an extensive maintenance of traffic plan. Either way, the cost for maintenance of traffic for a roundabout will be significantly greater than that for a signal.**

In summary, installation of the traffic signal is a less expensive option as compared to the construction of the roundabout and in no way does the signal preclude the installation of a roundabout. If in the future, the County and VDOT are able to acquire the necessary right of way in order to install a roundabout at this intersection, the signal can be easily replaced.

APPENDIX

APPENDIX A

OPTION A
LCPS LENAH PROPERTY
ROUTE 50 FRONTAGE IMPROVEMENTS
DULLES ELECTION DISTRICT LOUDOUN COUNTY, VIRGINIA
Bowman CONSULTING
1 of 4
MATCHLINE - SEE BELOW
GRAPHIC SCALE
LENAH ROAD - RTE. 800
VA STATE ROUTE 50
VA STATE ROUTE 50-JOHN MOSBY HIGHWAY
RURAL MINOR ARTERIAL (GS-2)
VARIABLE WIDTH RIGHT-OF-WAY
55 MPH DESIGN SPEED
ADT = 18,000 VPD
LENAH RUN
MATCHLINE - SEE ABOVE
LEGEND
PROPOSED RIGHT-OF-WAY DEDICATION

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OPTION B
LCPS LENAH PROPERTY
ROUTE 50 FRONTAGE IMPROVEMENTS
DULLES ELECTION DISTRICT LOUDOUN COUNTY, VIRGINIA
Bowman CONSULTING
VA STATE ROUTE 50
VA STATE ROUTE 50—JOHN MOSBY HIGHWAY
RURAL MINOR ARTERIAL (CS-2)
VARIABLE WIDTH RIGHT-OF-WAY
55 MPH DESIGN SPEED
ADT = 18,000 VPD
GRAPHIC SCALE
MATCHLINE SEE BELOW
MATCHLINE SEE ABOVE
LENAH ROAD - RTE. 600
LEGEND
PROPOSED RIGHT-OF-WAY DEDICATION
2 of 4

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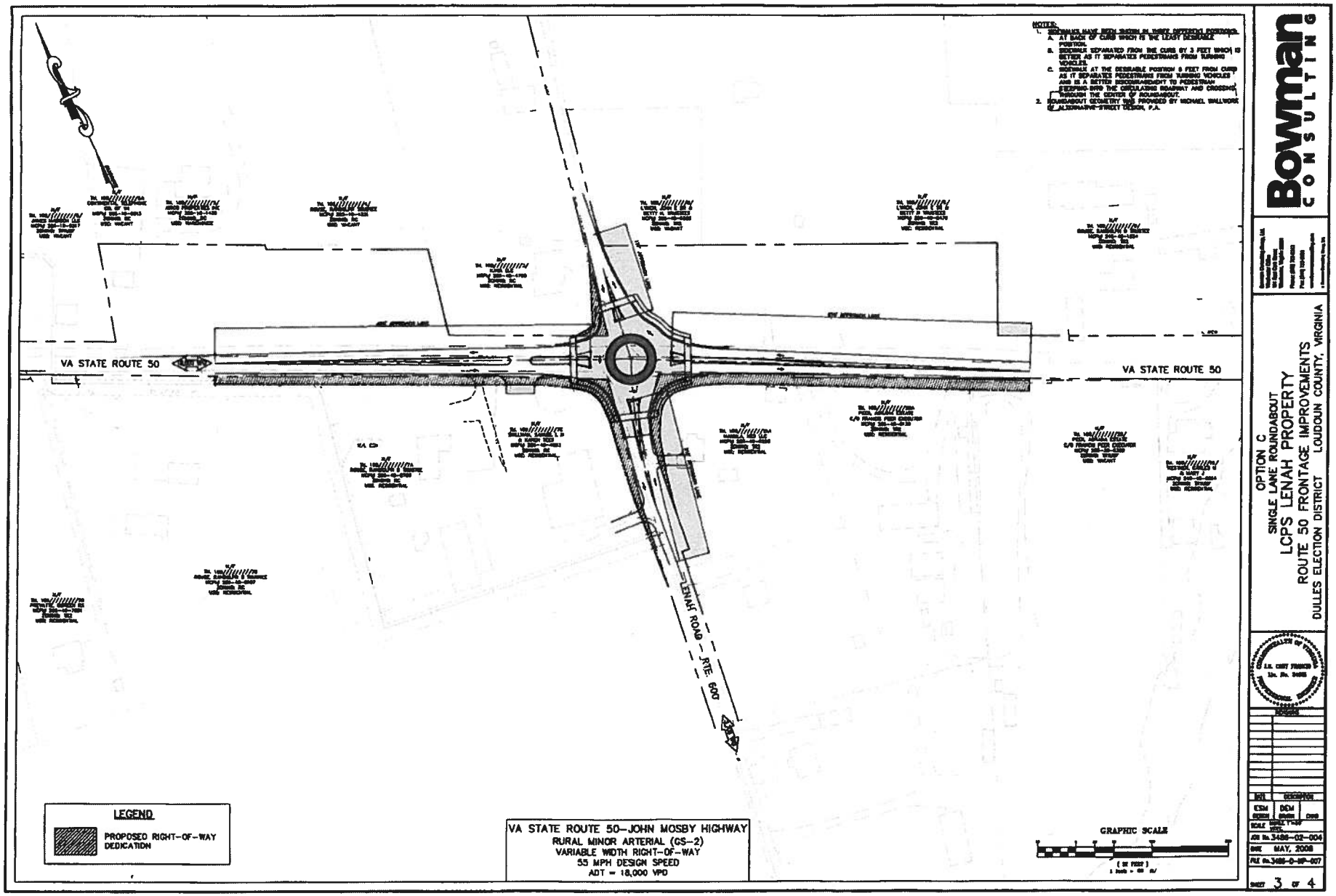
NOTES:
1. SIDEWALKS HAVE BEEN SHOWN IN THREE DIFFERENT LOCATIONS:
A. AT BACK OF CURB WHICH IS THE LEAST DESIRABLE POSITION.
B. SIDEWALK SEPARATED FROM THE CURB BY 3 FEET WHICH IS BETTER AS IT SEPARATES PEDESTRIANS FROM TURNING VEHICLES.
C. SIDEWALK AT THE DESIRABLE POSITION 6 FEET FROM CURB AS IT SEPARATES PEDESTRIANS FROM TURNING VEHICLES AND IS A BETTER ACCOMMODATION TO PEDESTRIAN CROSSING OVER THE CIRCULATING ROADWAY AND CROSSING THROUGH THE CENTER OF ROUNDABOUT.
2. ROUNDABOUT GEOMETRY WAS PROVIDED BY MICHAEL WALLWORK OF ALEXANDRINE STREET DESIGN, P.A.
VA STATE ROUTE 50
VA STATE ROUTE 50
LENAH ROAD - RTE. 600
LEGEND
PROPOSED RIGHT-OF-WAY DEDICATION
VA STATE ROUTE 50-JOHN MOSBY HIGHWAY
RURAL MINOR ARTERIAL (GS-2)
VARIABLE WIDTH RIGHT-OF-WAY
55 MPH DESIGN SPEED
ADT = 18,000 VPD
GRAPHIC SCALE
Bowman CONSULTING
OPTION C
SINGLE LANE ROUNDABOUT
LCPS LENAH PROPERTY
ROUTE 50 FRONTAGE IMPROVEMENTS
DULLES ELECTION DISTRICT LOUDOUN COUNTY, VIRGINIA
DATE DESCRIPTION
ESM DCM
JOB No. 3486-02-004
DATE MAY, 2008
FILE No. 3486-0-RP-007
SHEET 3 OF 4

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OPTION D
DOUBLE LANE ROUNDABOUT
LCPS LENAH PROPERTY
ROUTE 50 FRONTAGE IMPROVEMENTS
DULLES ELECTION DISTRICT LOUDOUN COUNTY, VIRGINIA
Bowman CONSULTING
4 of 4
GRAPHIC SCALE
LENAH ROAD - RTE. 600
VA STATE ROUTE 50
VA STATE ROUTE 50-JOHN MOSBY HIGHWAY
RURAL MINOR ARTERIAL (GS-2)
VARIABLE WIDTH RIGHT-OF-WAY
55 MPH DESIGN SPEED
ADT = 18,000 VPD
LEGEND
PROPOSED RIGHT-OF-WAY DEDICATION

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APPENDIX B

Route 50 and Lenah Road Intersection
Evaluation of Intersection Improvements

Prepared for: Loudoun County Public Schools Department of Planning and Legislative Services

Prepared by: Alternate Street Design, P.A.

Date: July 10, 2008

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Intersection of Route 50/Lenah Road

Executive Summary

This summary sheet was prepared to summarize the assumptions and findings of the three options that were considered during the evaluation of the Route 50 and Lenah Road intersection under different traffic volumes.

Option 1

Assumption - Traffic volumes used in the analysis include the existing 2007 traffic volumes shown in Figure 4, the middle school traffic and the Loop Road.

Findings -
1. A one lane roundabout, as shown in Appendix F, is expected to provide an acceptable level-of-service.
2. The expected spare capacity of this one lane roundabout is slightly higher than 20 percent.

Option 2

Assumption - Traffic volumes used include the 2010 traffic volumes as shown in Figure 14, includes existing traffic school, five proposed developments and the Loop Road.

Findings -
1. A two-lane roundabout will be necessary to accommodate the predicted traffic volumes expected in 2020 even though the predicted problems exceed the capacity of two lane road interrupted by cross streets and driveways.
2. Route 50 will need to be widened to four lanes prior to the opening of some of the proposed developments. Without widening to four lanes the predicted growth is unlikely to occur.

Option 3

Assumption - Traffic volumes used include the 2020 traffic volumes as shown in Figure 22, that includes the school, 5 proposed developments, future growth that is well beyond the capacity of the existing road and the Loop Road.

Findings -
1. A three-lane roundabout will be necessary to accommodate the predicted traffic volumes expected in 2020. The predicted volumes exceed the capacity of four lane, interrupted road
2. Route 50 will need to be widened to six lanes prior to enable traffic to grow to the predicted traffic volumes and the proposed developments to succeed.

Alternate Street Design, P.A.
1516 Plainfield Avenue, Orange Park, Florida 32073-3925
904-269-1851, Fax 904-278-4996, Email: mjwallwork@comcast.net

July 7, 2008

Mr.Randolph J. Vlad
Loudoun County Public Schools Department of Planning and Legislative Services
2100 Education Court
Ashburn, VA 20148

RE: Route 50 and Lenah Road intersection

Dear Mr. Vlad

As requested, a study of this intersection has been completed that analyzed under different traffic scenarios and prepared preliminary plans prepared for a one-lane and a two-lane roundabout.

The purposes of this study were to:

1. Identify proposed geometry consistent with FHA guidelines that would provide best case of adequate traffic performance while minimizing right-of-way acquisition.
2. Compare traffic capacity/operability of roundabouts vs. signalization under various traffic scenarios and lane configurations.

Capacity Analysis

Capacity analyses were undertaken for the AM and PM peak periods for the Route 50 and Lenah Road intersection as follows:

1. Existing traffic volume plus school traffic with, stop control, a one-lane roundabout and signal control. These scenarios were analyzed recognizing that growth projections, which are based on past periods of rapid growth, are unlikely to occur with current market conditions. This scenario also contemplates that LCPS should not be responsible for accommodating growth unrelated to the school construction. The WB left turn with signalization was chosen as the only scenario that could possibly be accomplished without right-of-way acquisition.
2. 2010 traffic volumes with school and developments with
   a. A two-lane roundabout
   b. Signalized intersection that includes Route 50 widened to four lanes.
3. 2020 traffic using:
   a. A three-lane roundabout
   b. Signalized intersection with Route 50 widened to six lanes.

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General Notes on Capacity Analyses

1. The 95th percentile queue is used as a more definitive indication on intersection performance because vehicle queues are highly visible and what everyone can clearly see and understand. Although in many cases the level-of-service is within acceptable range the 95th percentile queues are not.
2. Average queues are approximately half the 95th percentile queues.
3. The latest 2008 version of SIDRA was used because it is the only capacity analysis program that can analyze all forms of intersection control and therefore provide an accurate comparison between all forms of intersection control.
4. A three-phase cycle was used for the traffic signal analyses with a four second yellow and a two second all red.
5. PHF was 0.92 for all analyses.

Table 1. Existing traffic plus school traffic

Condition	Level-of-service		Average Delay		95th Percentile Queue	
	AM	PM	AM	PM	AM	PM
Existing + school Stop control	N/A	N/A	43.5	7.7	845	371
Existing + school Signalized	D	C	35.4	26.1	1089	947
Existing + school One-Lane roundabout	B	B	12.5	11.9	323	386

Table 2. Existing plus school traffic plus a westbound left turn for stop and signal control

Condition	Level-of-service		Average Delay		95th Percentile Queue	
	AM	PM	AM	PM	AM	PM
Existing + school Stop control + WB LT lane	N/A	N/A	41.2	5	845	55
Existing + school Signalized + WB LT lane	C	B	34.5	19.6	1210	489

Table 3. Existing conditions with 50 percent increase in traffic

Condition	Level-of-service		Average Delay		95th Percentile Queue	
	AM	PM	AM	PM	AM	PM
Existing + 20%, Signalized, turn lanes	D	B	43.9	18.2	2085	688
Existing + 20%, roundabout	C	B	24.5	12	657	767

Table 4. 2010 traffic volumes

Condition	Level-of-service		Average Delay		95th Percentile Queue	
	AM	PM	AM	PM	AM	PM
2010 traffic 2/1 lane roundabout	A	A	8.1	6.2	135	209
2010 traffic signalized 4 lanes	C	C	20.4	22.3	426	615

Table 5. 2020 traffic volumes

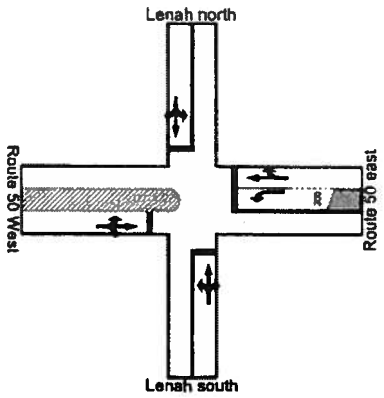
Condition	Level-of-service		Average Delay		95th Percentile Queue	
	AM	PM	AM	PM	AM	PM
2020 Traffic 3 lane roundabout	B	A	15.6	5.7	907	662
2020 Traffic signalized 6 lanes - Route 50	E	C	66.5	33.7	1461	1248

The above tables show the following:

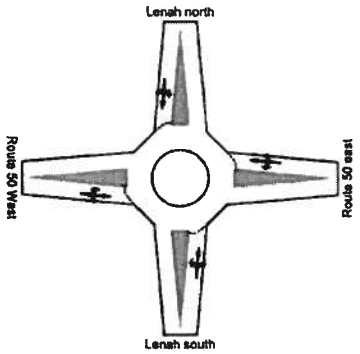
1. A one-lane roundabout can accommodate the existing traffic plus the school traffic.

2. Adding school traffic to the existing traffic causes significant vehicles queues to develop with stop control, although the level-of-service is within acceptable limits.
3. The addition of turn lanes to the stop and signal control under existing plus school traffic did little to improve the intersection operation because when the left turn volume is high the opposing through traffic is light and vice versa. Signalizing the existing intersection causes the intersection to approach failure. The addition of a westbound left turn lane to both the stop control and the signalized options improved their performance but is insufficient to enable them to match the performance of a one-lane roundabout.
4. The roundabout has up to 20 percent spare capacity, depending on driver's gap acceptance while the signalized intersection fails at less than a 20 percent increase in traffic volumes.
5. In 2010 when the proposed developments open as listed on Page 12 of the Loudoun County Public Schools, Traffic Study, a two-lane roundabout with one-lane north and south will be required. A signalized intersection has a poorer PM peak level-of-service with a longer 95th percentile queues even though Route 50 is widened to four lanes and a dual, WB left turn lane is added to the initial westbound left turn.
6. In 2020 the predicted traffic growth much higher than the capacity of Route 50 east and west of this location, and therefore, Route 50 must be widened to six lanes with either a three-lane roundabout or a very large signalized intersection with dual left turn lanes for the left turn from westbound left turn.

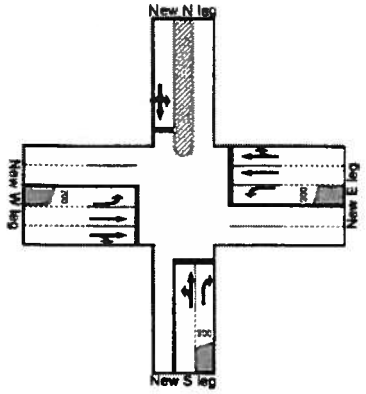
Layouts for the various layouts are shown below. Copies of the capacity analyses are included in Appendices A to E.



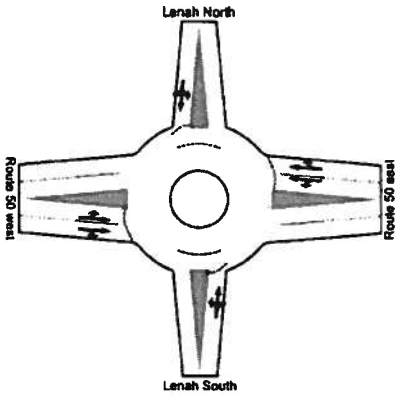
Lane arrangement used for stop and signal control with WB left turn lane



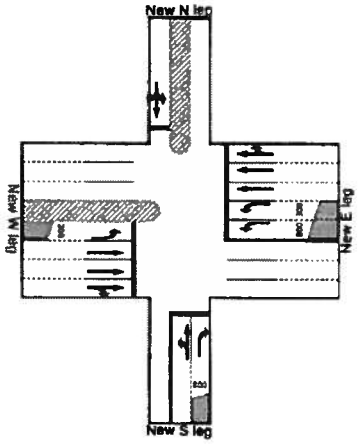
One-Lane roundabout used for existing traffic plus school traffic



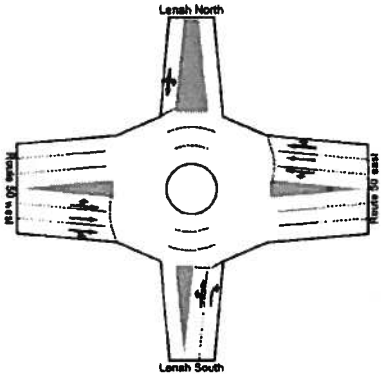
Four lane signalized intersection used for The 2010 analyses`



Two-Lane/One-Lane roundabout used for the 2010 traffic analyses with development



Six lane signalized intersection used for 2020 analyses



Three-Lane roundabout used for 2020 traffic plus development

Comments on the geometric design of the two roundabout options

One-lane roundabout

1. The one-lane roundabout was located off-center to the east to minimize right-of-way take on the west side of the intersection. No design meeting FHWA criteria is achievable without right-of-way acquisition.
2. Sidewalks are shown at different locations to show impacts on right-of-way with the sidewalk offset 6-foot from the back of curb as the preferred option. Sidewalks at back of curb are not recommended, unless right-of-way acquisition becomes a significant issue, to improve pedestrian control and safety. Because of the office, bakery and homes around the intersection pedestrian crossings, at least on the west side, are suggested to direct pedestrians to the correct crossing point.
3. The design vehicle was a WB-50, a furniture van making all movements and a WB-67 for through movements only along Route 50.

4. Design speed is approximately 23 mph.
5. Inclusion of vertical elements visible from at least 500 feet within the landscaped central island is critical to driver recognition of a roundabout.

Two-lane roundabout

1. This roundabout was located as far to the east as possible to minimize right-of-way impacts on the west side of Lenah Road.
2. The minor downside of this design is the higher than normal right turn movements east to north and south to east. An alternate is to move the roundabout to the northwest, closer to Lenah Road and bend Route 5. This location would acquire the house on the northwest corner, lessen the impact on both properties on the south side and reduce the right turn speeds. If possible, a relocation towards the northeast is preferred, if an center location is not possible.
3. The design vehicles are the same as the one-lane roundabout.
4. The design speed is approximately the same at just over 23 mph.
5. Sidewalks were added for the same reason as in the one-lane roundabout, to direction pedestrians to the correct crossing locations.

Apart from the operational superiority of roundabouts, roundabouts have much lower crash rate, a smaller carbon footprint, are the preferred traffic control option by Virginia Department of Transportation. A roundabout also creates a more pedestrian-friendly environment that could enhance development at this intersection.

Construction of roundabouts can be simplified by construction the exterior sections while maintaining the existing traffic patterns. Then the central island is coned off and the intersection converted to a roundabout while the central, then splitter islands, are constructed. A benefit of this construction program is that drivers learn how to drive a roundabout while it is a work zone.

Overall, roundabout control of the Route 50/Lenah Road intersection would provide a more efficient and safer option at a lower overall cost under all predicted traffic conditions.

Sincerely,
Alternate Street Design, P.A.

M J Wallwork

Michael J. Wallwork, P.E.
President

Appendix A

Existing Conditions with School Traffic

SIDRA INTERSECTION

Movement Summary

Route 50/Lenah Road AM Peak Existing traffic plus school

With loop road Fig 4 plus Fig 11 Stop Control

Two-way stop

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate	Aver Speed (mph)
Lenah south										
3L	L	42	2.3	1.303	205.6	LOS F	845	1.00	2.44	6.6
8T	T	1	0.0	1.000	205.6	LOS F	845	1.00	2.73	5.5
8R	R	253	1.2	1.303	205.6	LOS F	845	1.00	2.91	5.6
Approach		**298**	**1.3**	**1.300**	**205.6**	**LOS F**	**845**	**1.00**	**2.84**	**5.7**
Route 50 east										
1L	L	104	1.0	0.381	20.5	LOS C	137	1.00	1.09	24.9
6T	T	300	1.0	0.381	11.4	LOS B	137	1.00	0.00	30.0
6R	R	3	25.0	0.364	20.3	LOS C	137	1.00	0.00	25.0
Approach		**408**	**1.2**	**0.381**	**13.8**	**LOS B**	**137**	**1.00**	**0.28**	**28.5**
Lenah north										
7L	L	1	0.0	0.021	30.7	LOS D	2	0.78	1.00	19.6
4T	T	1	0.0	0.021	30.7	LOS D	2	0.78	1.00	19.7
4R	R	1	0.0	0.021	30.7	LOS D	2	0.78	0.62	19.6
Approach		**3**	**0.0**	**0.021**	**30.7**	**LOS D**	**2**	**0.78**	**0.87**	**19.6**
Route 50 West										
5L	L	2	33.3	0.500	14.0	LOS B	319	0.85	0.94	28.3
2T	T	895	1.0	0.512	4.9	LOS A	319	0.85	0.00	32.8
2R	R	51	1.9	0.510	13.9	LOS B	319	0.85	0.10	28.4
Approach		**950**	**1.2**	**0.512**	**5.4**	**LOS A**	**319**	**0.85**	**0.01**	**32.5**
All Vehicles		**1659**	**1.2**	**1.303**	**43.5**	**Not Applicable**	**845**	**0.91**	**0.58**	**17.2**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

A-140

SIDRA INTERSECTION

Movement Summary

Route 50/Lenah Road PM Peak Existing traffic plus school

With loop road Fig 4 plus Fig 11 Stop control

Two-way stop

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate	Aver Speed (mph)
Lenah south										
3L	L	28	3.4	0.341	27.7	LOS D	52	0.65	1.08	18.9
8T	T	1	0.0	0.333	27.7	LOS D	52	0.65	1.08	19.0
8R	R	51	1.9	0.342	27.7	LOS D	52	0.65	0.92	18.9
Approach		**82**	**2.4**	**0.343**	**27.7**	**LOS D**	**52**	**0.65**	**0.98**	**18.9**
Route 50 east										
1L	L	234	0.9	0.654	15.2	LOS C	371	0.75	0.83	36.0
6T	T	892	1.0	0.653	3.6	LOS A	371	0.75	0.00	43.7
6R	R	2	33.3	0.600	15.3	LOS C	371	0.75	0.18	35.9
Approach		**1128**	**1.1**	**0.654**	**6.0**	**LOS A**	**371**	**0.75**	**0.17**	**41.8**
Lenah north										
7L	L	1	0.0	0.056	22.7	LOS C	5	0.80	1.00	20.5
4T	T	1	0.0	0.056	22.7	LOS C	5	0.80	1.00	24.7
4R	R	9	10.0	0.056	22.7	LOS C	5	0.80	0.93	24.6
Approach		**12**	**8.3**	**0.056**	**22.7**	**LOS C**	**5**	**0.80**	**0.94**	**24.2**
Route 50 West										
5L	L	1	0.0	0.125	18.4	LOS C	55	0.78	0.95	33.5
2T	T	221	0.9	0.131	6.8	LOS A	55	0.78	0.00	43.3
2R	R	18	5.3	0.131	18.6	LOS C	55	0.78	0.16	33.4
Approach		**240**	**1.2**	**0.131**	**7.8**	**LOS A**	**55**	**0.78**	**0.02**	**42.3**
All Vehicles		**1462**	**1.2**	**0.654**	**7.7**	**Not Applicable**	**371**	**0.75**	**0.20**	**39.5**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

A-141

SIDRA INTERSECTION

Movement Summary

Route 50/Lenah Road AM Peak Existing traffic plus school

With loop road Fig 4 plus Fig 11 Signals no turn lanes

Signalised - Pretimed **Cycle Time = 100 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate	Aver Speed (mph)
Lenah south										
3L	L	42	2.3	0.888	77.8	LOS E	471	1.00	0.98	14.8
8T	T	1	0.0	0.833	66.2	LOS E	471	1.00	1.02	13.6
8R	R	253	1.2	0.887	75.2	LOS E	471	1.00	1.02	12.4
Approach		**298**	**1.3**	**0.887**	**75.5**	**LOS E**	**471**	**1.00**	**1.02**	**12.8**
Route 50 east										
1L	L	104	1.0	0.800	45.3	LOS D	398	1.00	0.96	17.1
6T	T	300	1.0	0.801	36.2	LOS D	398	1.00	0.96	19.4
6R	R	3	25.0	0.840	39.1	LOS D	387	1.00	0.90	18.6
Approach		**408**	**1.2**	**0.800**	**38.5**	**LOS D**	**398**	**1.00**	**0.96**	**18.8**
Lenah north										
7L	L	1	0.0	0.012	49.7	LOS D	5	0.92	0.63	16.2
4T	T	1	0.0	0.012	40.6	LOS D	5	0.92	0.58	18.3
4R	R	1	0.0	0.012	49.6	LOS D	5	0.92	0.64	16.2
Approach		**3**	**0.0**	**0.012**	**46.6**	**LOS D**	**5**	**0.92**	**0.62**	**16.8**
Route 50 West										
5L	L	2	33.3	0.725	29.8	LOS C	971	0.82	0.88	21.2
2T	T	895	1.0	0.749	20.7	LOS C	971	0.82	0.75	24.9
2R	R	51	1.9	0.749	32.2	LOS C	1089	0.94	0.91	20.5
Approach		**950**	**1.2**	**0.749**	**21.4**	**LOS C**	**971**	**0.83**	**0.76**	**24.6**
All Vehicles		**1659**	**1.2**	**0.888**	**35.4**	**LOS D**	**1089**	**0.90**	**0.86**	**19.7**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue

A-142

SIDRA INTERSECTION

Movement Summary

Route 50/Lenah Road PM Peak Existing traffic plus school

With loop road Fig 4 plus Fig 11 Signals No turn lanes

Signalised - Pretimed **Cycle Time = 70 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate	Aver Speed (mph)
Lenah south										
3L	L	28	3.4	0.537	51.3	LOS D	106	1.00	0.78	14.7
8T	T	1	0.0	0.530	43.5	LOS D	106	1.00	0.78	16.1
8R	R	51	1.9	0.537	51.2	LOS D	106	1.00	0.78	14.7
Approach		**82**	**2.4**	**0.537**	**51.1**	**LOS D**	**106**	**1.00**	**0.78**	**14.7**
Route 50 east										
1L	L	234	0.9	0.818	26.0	LOS C	823	0.83	0.93	28.9
6T	T	892	1.0	0.817	14.4	LOS B	823	0.83	0.80	37.0
6R	R	2	33.3	0.808	28.0	LOS C	947	0.98	0.97	27.8
Approach		**1128**	**1.1**	**0.817**	**16.8**	**LOS B**	**823**	**0.83**	**0.83**	**35.0**
Lenah north										
7L	L	1	0.0	0.063	37.8	LOS D	16	0.95	0.68	17.3
4T	T	1	0.0	0.063	34.8	LOS C	16	0.95	0.66	22.1
4R	R	9	10.0	0.063	41.2	LOS D	16	0.95	0.69	19.9
Approach		**12**	**8.3**	**0.063**	**40.4**	**LOS D**	**16**	**0.95**	**0.69**	**19.8**
Route 50 West										
5L	L	1	0.0	0.875	71.4	LOS E	307	1.00	0.97	15.8
2T	T	221	0.9	0.878	59.9	LOS E	307	1.00	0.97	18.2
2R	R	18	5.3	0.881	71.6	LOS E	307	1.00	0.97	15.7
Approach		**240**	**1.2**	**0.878**	**60.8**	**LOS E**	**307**	**1.00**	**0.97**	**17.9**
All Vehicles		**1462**	**1.2**	**0.881**	**26.1**	**LOS C**	**947**	**0.87**	**0.85**	**28.5**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue

A-143

SIDRA INTERSECTION

Movement Summary

Route 50/Lenah Road PM Peak Existing traffic plus school

With loop road Fig 4 plus Fig 11 One lane Roundabout

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate	Aver Speed (mph)
Lenah south										
3L	L	28	3.4	0.092	11.9	LOS B	16	0.43	0.67	26.7
8T	T	1	0.0	0.091	6.0	LOS A	16	0.43	0.52	29.4
8R	R	51	1.9	0.092	7.1	LOS A	16	0.43	0.54	28.9
Approach		**82**	**2.4**	**0.092**	**8.8**	**LOS A**	**16**	**0.43**	**0.59**	**28.0**
Route 50 east										
1L	L	234	0.9	0.782	16.1	LOS B	386	0.40	0.61	34.8
6T	T	892	1.0	0.782	10.7	LOS B	386	0.40	0.52	38.2
6R	R	2	33.3	0.750	11.4	LOS B	386	0.40	0.55	37.7
Approach		**1128**	**1.1**	**0.783**	**11.9**	**LOS B**	**386**	**0.40**	**0.53**	**37.4**
Lenah north										
7L	L	1	0.0	0.042	24.6	LOS C	8	0.87	0.84	21.5
4T	T	1	0.0	0.042	23.1	LOS C	8	0.87	0.82	27.6
4R	R	9	10.0	0.041	23.9	LOS C	8	0.87	0.71	27.1
Approach		**12**	**8.3**	**0.041**	**23.9**	**LOS C**	**8**	**0.87**	**0.73**	**26.5**
Route 50 West										
5L	L	1	0.0	0.250	17.5	LOS B	51	0.50	0.75	34.5
2T	T	221	0.9	0.271	12.2	LOS B	51	0.50	0.68	37.6
2R	R	18	5.3	0.271	12.9	LOS B	51	0.50	0.67	37.2
Approach		**240**	**1.2**	**0.271**	**12.3**	**LOS B**	**51**	**0.50**	**0.67**	**37.6**
All Vehicles		**1462**	**1.2**	**0.782**	**11.9**	**LOS B**	**386**	**0.43**	**0.56**	**36.7**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue

A-144

Appendix B

Existing Conditions with School Traffic Plus Eastbound Right Turn Lane and Westbound Left Turn Lanes

SIDRA INTERSECTION

Movement Summary

Route 50/Lenah Road AM Peak Existing traffic plus school

With loop road Fig 4 plus Fig 11 Stop Control LT lane

Two-way stop

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate	Aver Speed (mph)
Lenah south										
3L	L	42	2.3	1.303	205.6	LOS F	845	1.00	2.43	6.6
8T	T	1	0.0	1.000	205.6	LOS F	845	1.00	2.78	5.6
8R	R	253	1.2	1.303	205.6	LOS F	845	1.00	2.90	5.6
Approach		**298**	**1.3**	**1.300**	**205.6**	**LOS F**	**845**	**1.00**	**2.84**	**5.7**
Route 50 east										
1L	L	104	1.0	0.218	16.5	LOS C	26	0.76	0.94	26.9
6T	T	300	1.0	0.162	0.0	LOS A	0	0.00	0.00	40.0
6R	R	3	25.0	0.160	8.9	LOS A	0	0.00	0.69	31.7
Approach		**408**	**1.2**	**0.218**	**4.3**	**LOS A**	**26**	**0.19**	**0.25**	**35.5**
Lenah north										
7L	L	1	0.0	0.021	30.7	LOS D	2	0.79	1.00	19.6
4T	T	1	0.0	0.021	30.7	LOS D	2	0.79	1.00	19.6
4R	R	1	0.0	0.021	30.7	LOS D	2	0.79	0.62	19.6
Approach		**3**	**0.0**	**0.021**	**30.7**	**LOS D**	**2**	**0.79**	**0.87**	**19.6**
Route 50 West										
5L	L	2	33.3	0.500	14.0	LOS B	319	0.85	0.94	28.3
2T	T	895	1.0	0.512	4.9	LOS A	319	0.85	0.00	32.8
2R	R	51	1.9	0.510	13.9	LOS B	319	0.85	0.10	28.4
Approach		**950**	**1.2**	**0.512**	**5.4**	**LOS A**	**319**	**0.85**	**0.01**	**32.5**
All Vehicles		**1659**	**1.2**	**1.303**	**41.2**	**Not Applicable**	**845**	**0.71**	**0.58**	**17.7**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

A-146

SIDRA INTERSECTION

Movement Summary

Route 50/Lenah Road PM Peak Existing traffic plus school

With loop road Fig 4 plus Fig 11 Stop control LT Lane

Two-way stop

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate	Aver Speed (mph)
Lenah south										
3L	L	28	3.4	0.341	27.7	LOS D	52	0.65	1.08	18.9
8T	T	1	0.0	0.333	27.7	LOS D	52	0.65	1.08	18.9
8R	R	51	1.9	0.342	27.7	LOS D	52	0.65	0.92	18.9
Approach		**82**	**2.4**	**0.343**	**27.7**	**LOS D**	**52**	**0.65**	**0.98**	**18.9**
Route 50 east										
1L	L	234	0.9	0.177	12.6	LOS B	25	0.36	0.72	37.9
6T	T	892	1.0	0.476	0.0	LOS A	0	0.00	0.00	55.0
6R	R	2	33.3	0.500	11.7	LOS B	0	0.00	0.74	39.1
Approach		**1128**	**1.1**	**0.477**	**2.6**	**LOS A**	**25**	**0.07**	**0.15**	**50.4**
Lenah north										
7L	L	1	0.0	0.056	22.7	LOS C	5	0.80	1.00	20.5
4T	T	1	0.0	0.056	22.7	LOS C	5	0.80	1.00	24.6
4R	R	9	10.0	0.056	22.7	LOS C	5	0.80	0.93	24.6
Approach		**12**	**8.3**	**0.056**	**22.7**	**LOS C**	**5**	**0.80**	**0.94**	**24.2**
Route 50 West										
5L	L	1	0.0	0.125	18.4	LOS C	55	0.78	0.95	33.5
2T	T	221	0.9	0.131	6.8	LOS A	55	0.78	0.00	43.3
2R	R	18	5.3	0.131	18.6	LOS C	55	0.78	0.16	33.4
Approach		**240**	**1.2**	**0.131**	**7.8**	**LOS A**	**55**	**0.78**	**0.02**	**42.3**
All Vehicles		**1462**	**1.2**	**0.500**	**5.0**	**Not Applicable**	**55**	**0.23**	**0.18**	**45.2**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

A-147

SIDRA INTERSECTION

Movement Summary

Route 50/Lenah Road AM Peak Existing traffic plus school

With loop road Fig 4 plus Fig 11 Signals with LT lane

Signalised - Pretimed **Cycle Time = 100 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate	Aver Speed (mph)
Lenah south										
3L	L	42	2.3	0.888	77.8	LOS E	471	1.00	0.98	14.8
8T	T	1	0.0	0.833	66.2	LOS E	471	1.00	1.02	13.6
8R	R	253	1.2	0.887	75.2	LOS E	471	1.00	1.02	12.4
Approach		**298**	**1.3**	**0.887**	**75.5**	**LOS E**	**471**	**1.00**	**1.02**	**12.8**
Route 50 east										
1L	L	104	1.0	0.466	35.0	LOS D	113	0.94	0.79	19.6
6T	T	300	1.0	0.231	6.5	LOS A	192	0.41	0.35	33.6
6R	R	3	25.0	0.235	15.4	LOS B	192	0.41	0.76	27.5
Approach		**408**	**1.2**	**0.466**	**13.8**	**LOS B**	**192**	**0.54**	**0.47**	**28.4**
Lenah north										
7L	L	1	0.0	0.012	49.5	LOS D	5	0.92	0.63	16.2
4T	T	1	0.0	0.012	40.6	LOS D	5	0.92	0.58	18.3
4R	R	1	0.0	0.012	49.6	LOS D	5	0.92	0.64	16.2
Approach		**3**	**0.0**	**0.012**	**46.6**	**LOS D**	**5**	**0.92**	**0.62**	**16.9**
Route 50 West										
5L	L	2	33.3	0.893	39.0	LOS D	1210	0.95	1.01	18.6
2T	T	895	1.0	0.885	29.9	LOS C	1210	0.95	0.98	21.3
2R	R	51	1.9	0.884	38.8	LOS D	1207	0.94	1.01	18.6
Approach		**950**	**1.2**	**0.886**	**30.5**	**LOS C**	**1210**	**0.95**	**0.98**	**21.1**
All Vehicles		**1659**	**1.2**	**0.893**	**34.5**	**LOS C**	**1210**	**0.86**	**0.86**	**20.0**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue

A-148

SIDRA INTERSECTION

Movement Summary

Route 50/Lenah Road PM Peak Existing traffic plus school

With loop road Fig 4 plus Fig 11 Signals with LT Lane

Signalised - Pretimed **Cycle Time = 40 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate	Aver Speed (mph)
Lenah south										
3L	L	28	3.4	0.304	25.6	LOS C	57	0.93	0.76	20.7
8T	T	1	0.0	0.303	18.0	LOS B	57	0.93	0.71	23.6
8R	R	51	1.9	0.303	25.6	LOS C	57	0.93	0.76	20.7
Approach		**82**	**2.4**	**0.303**	**25.5**	**LOS C**	**57**	**0.93**	**0.76**	**20.8**
Route 50 east										
1L	L	234	0.9	0.363	19.2	LOS B	94	0.82	0.80	33.0
6T	T	892	1.0	0.839	15.4	LOS B	489	0.90	0.93	36.1
6R	R	2	33.3	0.779	27.1	LOS C	489	0.90	1.00	28.3
Approach		**1128**	**1.1**	**0.838**	**16.2**	**LOS B**	**489**	**0.88**	**0.90**	**35.4**
Lenah north										
7L	L	1	0.0	0.042	22.4	LOS C	9	0.88	0.68	21.9
4T	T	1	0.0	0.042	19.5	LOS B	9	0.88	0.64	29.8
4R	R	9	10.0	0.042	25.9	LOS C	9	0.88	0.69	26.0
Approach		**12**	**8.3**	**0.042**	**25.1**	**LOS C**	**9**	**0.88**	**0.69**	**25.9**
Route 50 West										
5L	L	1	0.0	0.741	44.9	LOS D	169	1.00	0.90	21.4
2T	T	221	0.9	0.762	33.4	LOS C	169	1.00	0.90	25.8
2R	R	18	5.3	0.079	27.0	LOS C	13	0.89	0.71	28.4
Approach		**240**	**1.2**	**0.761**	**32.9**	**LOS C**	**169**	**0.99**	**0.88**	**26.0**
All Vehicles		**1462**	**1.2**	**0.839**	**19.6**	**LOS B**	**489**	**0.90**	**0.89**	**32.3**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue

A-149

SIDRA INTERSECTION

Movement Summary

Route 50/Lenah Road AM Peak Existing traffic plus school

With loop road Fig 4 plus Fig 11

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate	Aver Speed (mph)
Lenah south										
3L	L	42	2.3	0.768	40.9	LOS D	252	1.00	1.19	23.3
8T	T	1	0.0	1.000	31.3	LOS C	252	1.00	1.25	20.9
8R	R	253	1.2	0.763	32.3	LOS C	252	1.00	1.19	20.5
Approach		**298**	**1.3**	**0.763**	**33.6**	**LOS C**	**252**	**1.00**	**1.19**	**20.9**
Route 50 east										
1L	L	104	1.0	0.323	12.3	LOS B	77	0.25	0.64	29.3
6T	T	300	1.0	0.323	6.4	LOS A	77	0.25	0.47	32.8
6R	R	3	25.0	0.333	7.3	LOS A	77	0.25	0.52	32.1
Approach		**408**	**1.2**	**0.323**	**7.9**	**LOS A**	**77**	**0.25**	**0.52**	**31.8**
Lenah north										
7L	L	1	0.0	0.004	14.8	LOS B	1	0.54	0.64	28.3
4T	T	1	0.0	0.004	8.8	LOS A	1	0.54	0.54	31.4
4R	R	1	0.0	0.004	9.8	LOS A	1	0.54	0.54	31.0
Approach		**3**	**0.0**	**0.004**	**11.1**	**LOS B**	**1**	**0.54**	**0.57**	**30.1**
Route 50 West										
5L	L	2	33.3	0.750	13.8	LOS B	323	0.72	0.67	28.1
2T	T	895	1.0	0.791	7.9	LOS A	323	0.72	0.56	30.7
2R	R	51	1.9	0.788	8.9	LOS A	323	0.72	0.56	30.3
Approach		**950**	**1.2**	**0.791**	**8.0**	**LOS A**	**323**	**0.72**	**0.56**	**30.7**
All Vehicles		**1659**	**1.2**	**1.000**	**12.5**	**LOS B**	**323**	**0.65**	**0.66**	**28.5**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue

A-150

SIDRA INTERSECTION

Movement Summary

Route 50/Lenah Road AM Peak Existing traffic plus school

With loop road Fig 4 plus Fig 11 Signals with WB LT turn lane + 20% traffic

Signalised - Pretimed **Cycle Time = 150 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate	Aver Speed (mph)
Lenah south										
3L	L	51	2.0	0.899	97.1	LOS F	764	1.00	0.96	12.6
8T	T	1	0.0	0.893	85.4	LOS F	764	1.00	1.00	11.4
8R	R	304	1.0	0.899	97.7	LOS F	777	1.00	1.01	10.3
Approach		**356**	**1.1**	**0.899**	**97.6**	**LOS F**	**764**	**1.00**	**1.00**	**10.6**
Route 50 east										
1L	L	125	0.8	0.824	84.9	LOS F	249	1.00	0.94	11.4
6T	T	360	1.1	0.257	7.0	LOS A	277	0.35	0.31	33.2
6R	R	4	20.0	0.262	15.9	LOS B	277	0.35	0.76	27.2
Approach		**490**	**1.2**	**0.824**	**27.0**	**LOS C**	**277**	**0.52**	**0.48**	**22.3**
Lenah north										
7L	L	1	0.0	0.019	75.5	LOS E	8	0.96	0.62	12.4
4T	T	1	0.0	0.019	66.6	LOS E	8	0.96	0.60	13.6
4R	R	1	0.0	0.019	75.5	LOS E	8	0.96	0.64	12.4
Approach		**3**	**0.0**	**0.019**	**72.5**	**LOS E**	**8**	**0.96**	**0.62**	**12.8**
Route 50 West										
5L	L	3	25.0	0.875	42.8	LOS D	2085	0.94	0.97	17.6
2T	T	1073	1.0	0.911	33.8	LOS C	2085	0.94	0.92	20.1
2R	R	61	1.6	0.912	42.6	LOS D	2075	0.93	0.96	17.7
Approach		**1140**	**1.1**	**0.911**	**34.3**	**LOS C**	**2085**	**0.94**	**0.92**	**20.0**
All Vehicles		**1989**	**1.2**	**0.912**	**43.9**	**LOS D**	**2085**	**0.85**	**0.83**	**17.6**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

A-152

SIDRA INTERSECTION

Movement Summary

Route 50/Lenah Road PM Peak Existing traffic plus school

With loop road Fig 4 plus Fig 11 Signals with WB LT lane + 20% traffic

Signalised - Pretimed **Cycle Time = 50 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate	Aver Speed (mph)
Lenah south										
3L	L	34	2.9	0.455	35.0	LOS D	88	0.97	0.77	18.0
8T	T	1	0.0	0.463	27.3	LOS C	88	0.97	0.75	20.2
8R	R	61	1.6	0.455	34.9	LOS C	88	0.97	0.77	18.0
Approach		**98**	**2.0**	**0.455**	**34.9**	**LOS C**	**88**	**0.97**	**0.77**	**18.0**
Route 50 east										
1L	L	280	1.1	0.384	18.7	LOS B	116	0.75	0.81	33.4
6T	T	1071	1.0	0.866	15.5	LOS B	688	0.87	0.92	36.1
6R	R	3	25.0	0.893	27.2	LOS C	688	0.87	1.02	28.2
Approach		**1356**	**1.1**	**0.866**	**16.2**	**LOS B**	**688**	**0.85**	**0.90**	**35.5**
Lenah north										
7L	L	1	0.0	0.057	27.5	LOS C	12	0.91	0.68	20.1
4T	T	1	0.0	0.057	24.7	LOS C	12	0.91	0.65	26.7
4R	R	10	9.1	0.057	31.2	LOS C	12	0.91	0.69	23.6
Approach		**13**	**7.7**	**0.057**	**30.4**	**LOS C**	**12**	**0.91**	**0.69**	**23.5**
Route 50 West										
5L	L	1	0.0	0.556	32.1	LOS C	210	0.92	0.82	26.0
2T	T	265	1.1	0.543	20.5	LOS C	210	0.92	0.77	32.4
2R	R	22	4.3	0.541	32.7	LOS C	214	0.95	0.83	25.7
Approach		**289**	**1.4**	**0.543**	**21.6**	**LOS C**	**210**	**0.93**	**0.77**	**31.8**
All Vehicles		**1756**	**1.3**	**0.893**	**18.2**	**LOS B**	**688**	**0.87**	**0.87**	**33.3**

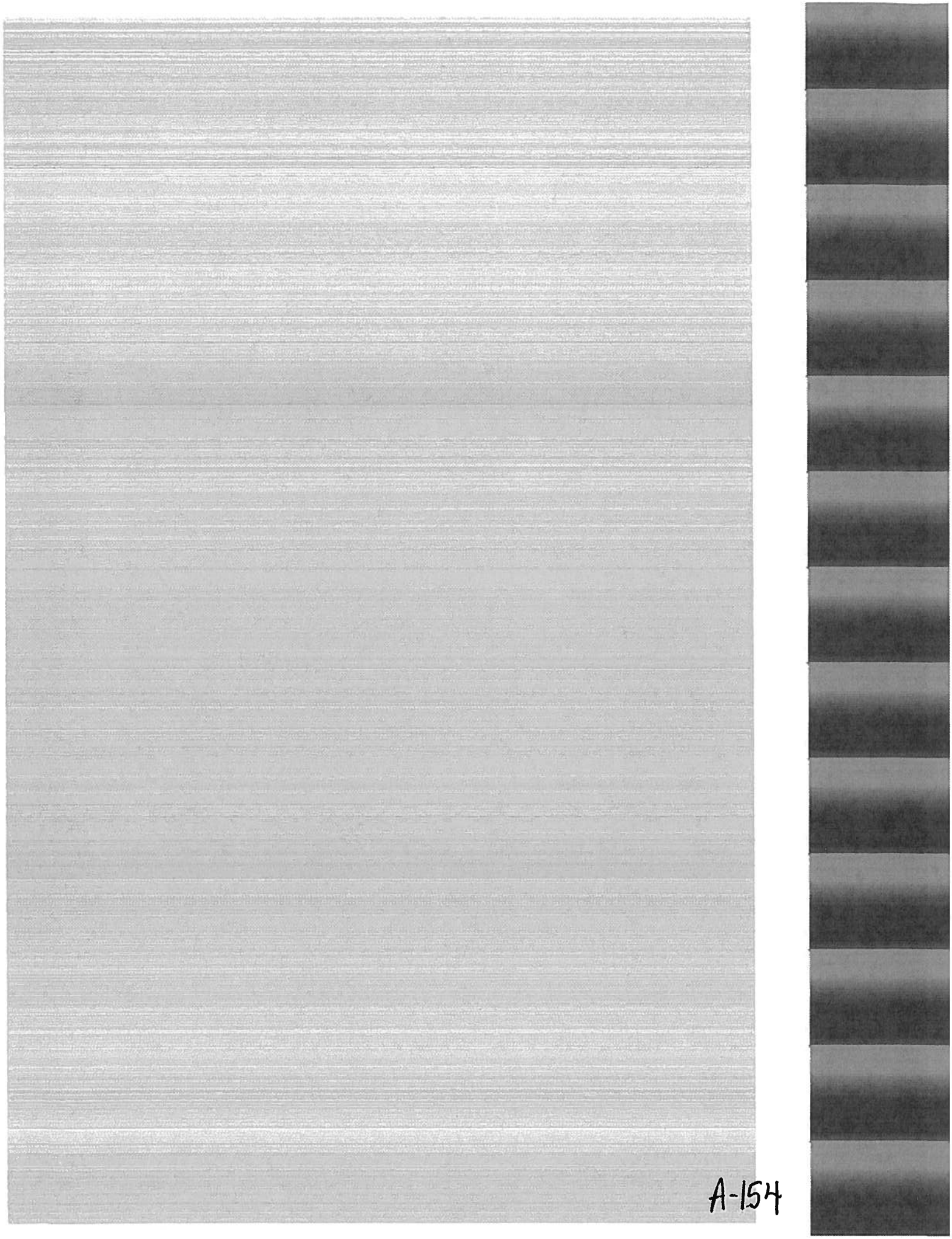
Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue

A-153



SIDRA INTERSECTION

Movement Summary

Route 50/Lenah Road PM Peak Existing traffic plus school

With loop road Fig 4 plus Fig 11 + 20% traffic Roundabout

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate	Aver Speed (mph)
Lenah south										
3L	L	34	2.9	0.099	11.1	LOS B	10	0.29	0.69	27.0
8T	T	1	0.0	0.100	5.3	LOS A	10	0.29	0.50	30.0
8R	R	61	1.6	0.100	6.4	LOS A	10	0.29	0.54	29.4
Approach		**98**	**2.0**	**0.099**	**8.1**	**LOS A**	**10**	**0.29**	**0.60**	**28.5**
Route 50 east										
1L	L	280	1.1	0.934	16.6	LOS B	767	0.71	0.50	33.9
6T	T	1071	1.0	0.934	11.2	LOS B	767	0.71	0.45	36.5
6R	R	3	25.0	1.000	11.8	LOS B	767	0.71	0.48	36.2
Approach		**1356**	**1.1**	**0.934**	**12.3**	**LOS B**	**767**	**0.71**	**0.46**	**35.9**
Lenah north										
7L	L	1	0.0	0.071	31.5	LOS C	15	0.95	0.92	19.4
4T	T	1	0.0	0.071	30.1	LOS C	15	0.95	0.91	24.1
4R	R	10	9.1	0.071	30.9	LOS C	15	0.95	0.74	23.7
Approach		**13**	**7.7**	**0.071**	**30.9**	**LOS C**	**15**	**0.95**	**0.76**	**23.3**
Route 50 West										
5L	L	1	0.0	0.333	16.6	LOS B	41	0.39	0.78	34.9
2T	T	265	1.1	0.303	11.3	LOS B	41	0.39	0.68	38.2
2R	R	22	4.3	0.303	12.0	LOS B	41	0.39	0.69	37.7
Approach		**289**	**1.4**	**0.303**	**11.4**	**LOS B**	**41**	**0.39**	**0.68**	**38.2**
All Vehicles		**1756**	**1.3**	**1.000**	**12.0**	**LOS B**	**767**	**0.63**	**0.51**	**35.7**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue

A-155

Appendix D

2010 Traffic

SIDRA INTERSECTION

Movement Summary

Route 50/Lenah Road AM Peak 2 lane roundabout

2010 with development Alternative II with loop road Fig. 14

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate	Aver Speed (mph)
Lenah South										
3L	L	42	2.3	0.642	21.8	LOS C	121	0.84	1.06	25.3
8T	T	1	50.0	0.667	14.3	LOS B	121	0.84	1.00	28.2
8R	R	253	2.0	0.642	15.4	LOS B	121	0.84	1.02	27.6
Approach		**298**	**2.3**	**0.642**	**16.3**	**LOS B**	**121**	**0.84**	**1.02**	**27.2**
Route 50 east										
1L	L	234	2.1	0.276	12.5	LOS B	62	0.22	0.63	29.4
6T	T	564	2.0	0.276	5.1	LOS A	64	0.22	0.40	33.8
6R	R	3	25.0	0.286	6.5	LOS A	64	0.21	0.49	32.8
Approach		**802**	**2.1**	**0.276**	**7.3**	**LOS A**	**64**	**0.22**	**0.47**	**32.3**
Lenah North										
7L	L	1	50.0	0.017	19.0	LOS B	3	0.60	0.82	26.5
4T	T	1	50.0	0.017	11.6	LOS B	3	0.60	0.71	29.9
4R	R	1	50.0	0.017	12.6	LOS B	3	0.60	0.65	29.2
Approach		**6**	**50.0**	**0.017**	**14.4**	**LOS B**	**3**	**0.60**	**0.73**	**28.4**
Route 50 west										
5L	L	2	33.3	0.500	14.1	LOS B	133	0.60	0.76	28.4
2T	T	1240	2.0	0.542	6.7	LOS A	135	0.59	0.57	31.8
2R	R	47	2.1	0.540	8.0	LOS A	135	0.58	0.62	31.2
Approach		**1290**	**2.1**	**0.542**	**6.7**	**LOS A**	**135**	**0.59**	**0.57**	**31.8**
All Vehicles		**2396**	**2.3**	**0.667**	**8.1**	**LOS A**	**135**	**0.49**	**0.59**	**31.3**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue

A-157

SIDRA INTERSECTION

Movement Summary

Route 50/Lenah Road PM Peak 2/1 Roundabout

2010 with development Alternative II with loop road Fig. 14

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate	Aver Speed (mph)
Lenah South										
3L	L	13	7.1	0.123	16.2	LOS B	16	0.63	0.89	27.9
8T	T	1	50.0	0.125	8.8	LOS A	16	0.63	0.76	31.6
8R	R	51	2.0	0.123	9.8	LOS A	16	0.63	0.74	31.1
Approach		**67**	**4.5**	**0.123**	**11.1**	**LOS B**	**16**	**0.63**	**0.77**	**30.3**
Route 50 east										
1L	L	234	2.1	0.603	12.4	LOS B	209	0.18	0.63	29.6
6T	T	1687	2.0	0.603	5.0	LOS A	209	0.17	0.39	34.1
6R	R	2	33.3	0.600	6.4	LOS A	208	0.16	0.48	33.0
Approach		**1924**	**2.1**	**0.603**	**5.9**	**LOS A**	**209**	**0.17**	**0.42**	**33.4**
Lenah North										
7L	L	1	50.0	0.049	23.6	LOS C	7	0.78	0.93	24.5
4T	T	1	50.0	0.049	16.1	LOS B	7	0.78	0.87	27.2
4R	R	9	10.0	0.049	17.2	LOS B	7	0.78	0.77	26.6
Approach		**14**	**21.4**	**0.049**	**18.0**	**LOS B**	**7**	**0.78**	**0.81**	**26.4**
Route 50 west										
5L	L	1	50.0	0.400	13.9	LOS B	89	0.52	0.76	28.6
2T	T	964	2.0	0.416	6.4	LOS A	90	0.51	0.55	32.2
2R	R	15	6.2	0.421	7.8	LOS A	90	0.50	0.60	31.5
Approach		**982**	**2.1**	**0.416**	**6.4**	**LOS A**	**90**	**0.51**	**0.55**	**32.2**
All Vehicles		**2987**	**2.2**	**0.603**	**6.2**	**LOS A**	**209**	**0.30**	**0.47**	**32.9**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue

A-158

SIDRA INTERSECTION

Movement Summary

Route 50/Lenah Road AM Peak Signallized

2010 with development Alternative II with loop road Fig. 14

Signalised - Pretimed **Cycle Time = 50 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate	Aver Speed (mph)
New S leg										
3L	L	42	2.3	0.116	25.8	LOS C	36	0.85	0.73	22.8
8T	T	1	50.0	0.116	17.0	LOS B	36	0.85	0.63	26.7
8R	R	253	2.0	0.769	43.7	LOS D	224	1.00	0.94	17.5
Approach		**298**	**2.3**	**0.769**	**40.9**	**LOS D**	**224**	**0.98**	**0.91**	**18.1**
New E leg										
1L	L	104	1.9	0.473	36.5	LOS D	93	0.97	0.77	19.3
6T	T	564	2.0	0.336	10.3	LOS B	161	0.70	0.59	30.7
6R	R	3	25.0	0.337	19.2	LOS B	161	0.70	0.80	25.5
Approach		**672**	**2.1**	**0.473**	**14.4**	**LOS B**	**161**	**0.74**	**0.62**	**28.1**
New N leg										
7L	L	1	50.0	0.020	27.4	LOS C	7	0.88	0.65	22.1
4T	T	1	50.0	0.020	18.7	LOS B	7	0.88	0.58	25.9
4R	R	1	50.0	0.020	27.6	LOS C	7	0.89	0.67	22.0
Approach		**6**	**50.0**	**0.020**	**24.6**	**LOS C**	**7**	**0.88**	**0.63**	**23.2**
New W leg										
5L	L	1	50.0	0.013	28.5	LOS C	2	0.90	0.63	21.7
2T	T	1240	2.0	0.765	18.4	LOS B	426	0.90	0.87	26.0
2R	R	47	2.1	0.763	27.4	LOS C	422	0.90	0.94	22.1
Approach		**1289**	**2.1**	**0.765**	**18.7**	**LOS B**	**426**	**0.90**	**0.87**	**25.8**
All Vehicles		**2265**	**2.3**	**0.769**	**20.4**	**LOS C**	**426**	**0.87**	**0.80**	**25.1**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue

A-159

SIDRA INTERSECTION

Movement Summary

Route 50/Lenah Road PM Peak Signallized

2010 with development Alternative II with loop road Fig. 14

Signalised - Pretimed **Cycle Time = 50 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate	Aver Speed (mph)
New S leg										
3L	L	13	7.1	0.069	28.9	LOS C	15	0.91	0.69	21.6
8T	T	1	50.0	0.069	20.1	LOS C	15	0.91	0.63	25.2
8R	R	51	2.0	0.258	32.1	LOS C	46	0.94	0.74	20.6
Approach		**67**	**4.5**	**0.258**	**31.1**	**LOS C**	**46**	**0.94**	**0.73**	**20.9**
New E leg										
1L	L	234	2.1	0.913	67.8	LOS E	252	1.00	1.08	13.4
6T	T	1687	2.0	0.879	22.4	LOS C	615	0.96	1.06	24.2
6R	R	2	33.3	0.857	31.3	LOS C	614	0.96	1.09	20.8
Approach		**1924**	**2.1**	**0.913**	**27.9**	**LOS C**	**615**	**0.97**	**1.06**	**22.0**
New N leg										
7L	L	1	50.0	0.071	29.0	LOS C	14	0.91	0.69	21.6
4T	T	1	50.0	0.071	20.2	LOS C	14	0.91	0.63	25.1
4R	R	9	10.0	0.071	29.2	LOS C	14	0.92	0.69	21.5
Approach		**14**	**21.4**	**0.071**	**27.9**	**LOS C**	**14**	**0.91**	**0.68**	**22.0**
New W leg										
5L	L	1	50.0	0.011	27.5	LOS C	2	0.88	0.63	22.1
2T	T	964	2.0	0.511	10.3	LOS B	264	0.72	0.63	30.7
2R	R	15	6.2	0.508	19.3	LOS B	263	0.72	0.82	25.5
Approach		**982**	**2.1**	**0.511**	**10.5**	**LOS B**	**264**	**0.72**	**0.63**	**30.6**
All Vehicles		**2987**	**2.2**	**0.913**	**22.3**	**LOS C**	**615**	**0.88**	**0.91**	**24.2**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue

A-160

Appendix E

2020 Traffic

SIDRA INTERSECTION

Movement Summary

Route 50/Lenah Road AM Peak Signalized

2020 Fig. 22 6 Lanes Route 50 Signalized

Signalised - Pretimed **Cycle Time = 150 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate	Aver Speed (mph)
New S leg										
3L	L	137	2.2	0.322	45.5	LOS D	307	0.78	0.80	17.2
8T	T	1	1.8	0.322	36.8	LOS D	307	0.78	0.65	19.3
8R	R	600	2.2	1.000#	63.2	LOS E	965	1.00	0.95	14.0
Approach		**739**	**2.2**	**1.000**	**57.9**	**LOS E**	**965**	**0.94**	**0.90**	**14.8**
New E leg										
1L	L	421	1.9	1.020	110.0	LOS F	883	0.98	1.11	9.5
6T	T	2147	2.0	0.735	34.0	LOS C	1119	0.85	0.78	20.0
6R	R	2	33.3	0.740	42.9	LOS D	1118	0.85	0.88	17.6
Approach		**2570**	**2.0**	**1.020**	**46.5**	**LOS D**	**1119**	**0.87**	**0.83**	**16.9**
New N leg										
7L	L	1	50.0	0.037	64.4	LOS E	39	0.89	0.69	13.9
4T	T	1	50.0	0.037	55.9	LOS E	39	0.89	0.62	15.2
4R	R	9	10.0	0.037	65.2	LOS E	39	0.90	0.72	13.7
Approach		**14**	**21.4**	**0.037**	**63.8**	**LOS E**	**39**	**0.90**	**0.70**	**13.9**
New W leg										
5L	L	1	50.0	0.048	80.2	LOS F	8	0.98	0.63	11.9
2T	T	1628	2.0	1.032	97.8	LOS F	1461	1.00	1.21	10.4
2R	R	171	1.8	1.032	107.5	LOS F	1394	1.00	1.21	9.6
Approach		**1801**	**2.1**	**1.032**	**98.7**	**LOS F**	**1461**	**1.00**	**1.21**	**10.3**
All Vehicles		**5124**	**2.1**	**1.032**	**66.5**	**LOS E**	**1461**	**0.93**	**0.98**	**13.6**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue

A-162

SIDRA INTERSECTION

Movement Summary

Route 50/Lenah Road PM Peak Signalized

2020 Fig. 22 6 Lanes Route 50 Signalized

Signalised - Pretimed **Cycle Time = 110 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate	Aver Speed (mph)
New S leg										
3L	L	57	1.8	0.249	53.9	LOS D	103	0.93	0.76	15.5
8T	T	1	50.0	0.249	45.0	LOS D	103	0.93	0.71	17.3
8R	R	193	2.1	0.865	88.7	LOS F	357	1.00	0.97	11.1
Approach		**252**	**2.4**	**0.865**	**80.6**	**LOS F**	**357**	**0.98**	**0.92**	**11.8**
New E leg										
1L	L	458	2.0	0.833	56.2	LOS E	594	0.96	0.95	15.1
6T	T	2147	2.0	0.831	19.7	LOS B	1248	0.81	0.76	25.4
6R	R	2	33.3	0.892	28.6	LOS C	1248	0.81	0.89	21.7
Approach		**2607**	**2.0**	**0.833**	**26.1**	**LOS C**	**1248**	**0.83**	**0.79**	**22.7**
New N leg										
7L	L	1	50.0	0.050	52.9	LOS D	30	0.92	0.68	15.7
4T	T	1	50.0	0.050	44.2	LOS D	30	0.92	0.63	17.4
4R	R	9	10.0	0.050	53.4	LOS D	30	0.93	0.71	15.5
Approach		**14**	**21.4**	**0.050**	**52.0**	**LOS D**	**30**	**0.93**	**0.69**	**15.8**
New W leg										
5L	L	1	50.0	0.035	59.3	LOS E	6	0.97	0.63	14.5
2T	T	1236	2.0	0.834	39.3	LOS D	916	0.97	0.93	18.6
2R	R	66	1.5	0.836	48.4	LOS D	902	0.97	0.95	16.5
Approach		**1304**	**2.1**	**0.834**	**39.8**	**LOS D**	**916**	**0.97**	**0.93**	**18.5**
All Vehicles		**4177**	**2.1**	**0.892**	**33.7**	**LOS C**	**1248**	**0.89**	**0.84**	**20.1**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue

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SIDRA INTERSECTION

Movement Summary

Route 50/Lenah Road AM Peak 3 lane Roundabout

2020 Fig. 22 volumes

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate	Aver Speed (mph)
Lenah South										
3L	L	137	2.2	0.509	22.6	LOS C	66	0.85	1.01	25.4
8T	T	1	50.0	0.500	13.7	LOS B	66	0.85	0.95	28.7
8R	R	600	2.0	1.149	86.1	LOS F	907	1.00	2.53	11.4
Approach		**739**	**2.2**	**1.149**	**74.1**	**LOS E**	**907**	**0.97**	**2.24**	**12.9**
Route 50 east										
1L	L	421	1.9	0.545	13.2	LOS B	162	0.51	0.63	28.9
6T	T	2147	2.0	0.546	4.2	LOS A	168	0.49	0.38	33.2
6R	R	4	20.0	0.556	6.0	LOS A	162	0.51	0.51	32.1
Approach		**2572**	**2.0**	**0.546**	**5.7**	**LOS A**	**168**	**0.49**	**0.42**	**32.3**
Lenah North										
7L	L	1	50.0	0.071	26.3	LOS C	9	0.86	0.96	24.0
4T	T	1	50.0	0.071	17.4	LOS B	9	0.86	0.90	26.7
4R	R	9	10.0	0.072	18.5	LOS B	9	0.86	0.83	26.0
Approach		**14**	**21.4**	**0.072**	**19.4**	**LOS B**	**9**	**0.86**	**0.86**	**25.8**
Route 50 west										
5L	L	1	50.0	0.500	14.7	LOS B	112	0.70	0.82	28.3
2T	T	1628	2.0	0.461	5.5	LOS A	123	0.68	0.50	32.1
2R	R	171	1.8	0.462	7.5	LOS A	112	0.70	0.63	31.2
Approach		**1801**	**2.1**	**0.461**	**5.7**	**LOS A**	**123**	**0.68**	**0.51**	**32.0**
All Vehicles		**5126**	**2.1**	**1.149**	**15.6**	**LOS B**	**907**	**0.63**	**0.72**	**26.5**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue

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SIDRA INTERSECTION

Movement Summary

Route 50/Lenah Road PM Peak 3 lane Roundabout

2020 Fig. 22 volumes

Roundabout

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (ft)	Prop. Queued	Eff. Stop Rate	Aver Speed (mph)
Lenah South										
3L	L	57	1.8	0.152	17.1	LOS B	16	0.67	0.89	27.9
8T	T	1	50.0	0.154	8.1	LOS A	16	0.67	0.74	32.2
8R	R	193	2.1	0.292	7.3	LOS A	37	0.65	0.64	31.6
Approach		**252**	**2.4**	**0.292**	**9.5**	**LOS A**	**37**	**0.65**	**0.69**	**30.6**
Route 50 east										
1L	L	458	2.0	0.516	12.7	LOS B	151	0.31	0.60	29.5
6T	T	2147	2.0	0.516	3.8	LOS A	152	0.29	0.34	34.4
6R	R	2	33.3	0.500	5.4	LOS A	151	0.31	0.44	33.1
Approach		**2607**	**2.0**	**0.516**	**5.3**	**LOS A**	**152**	**0.30**	**0.38**	**33.3**
Lenah North										
7L	L	1	50.0	0.059	24.3	LOS C	7	0.82	0.94	24.7
4T	T	1	50.0	0.059	15.5	LOS B	7	0.82	0.88	27.7
4R	R	9	10.0	0.058	16.6	LOS B	7	0.82	0.81	27.0
Approach		**14**	**21.4**	**0.058**	**17.5**	**LOS B**	**7**	**0.82**	**0.84**	**26.7**
Route 50 west										
5L	L	1	50.0	0.333	14.6	LOS B	72	0.63	0.82	28.5
2T	T	1236	2.0	0.335	5.4	LOS A	80	0.62	0.49	32.5
2R	R	66	1.5	0.335	7.4	LOS A	72	0.63	0.63	31.5
Approach		**1304**	**2.1**	**0.335**	**5.6**	**LOS A**	**80**	**0.62**	**0.50**	**32.4**
All Vehicles		**4177**	**2.1**	**0.516**	**5.7**	**LOS A**	**152**	**0.42**	**0.44**	**32.8**

Symbols which may appear in this table:

Following Degree of Saturation
x = 1.00 for Short Lane with resulting Excess Flow
* x = 1.00 due to minimum capacity

Following LOS
- Based on density for continuous movements

Following Queue

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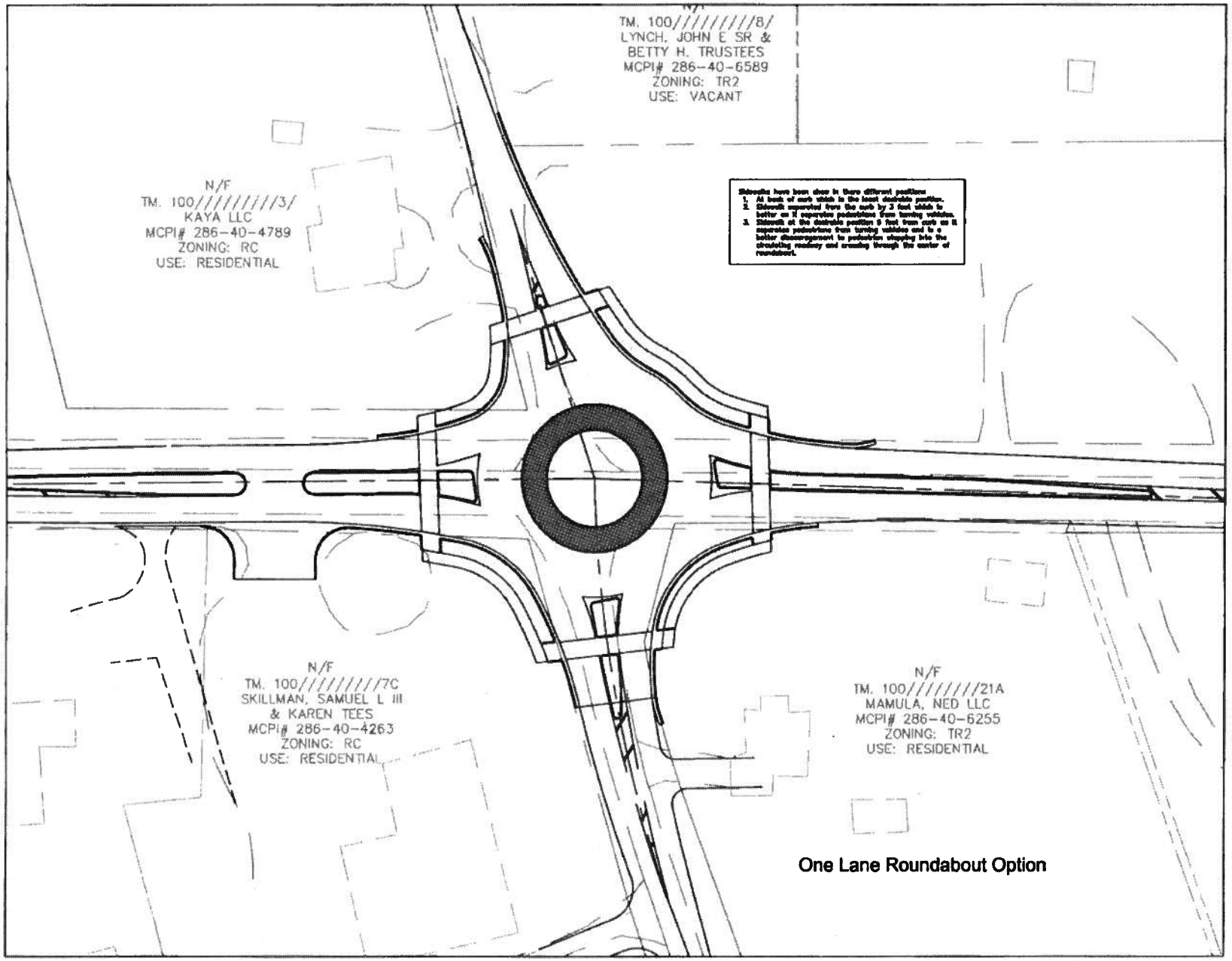
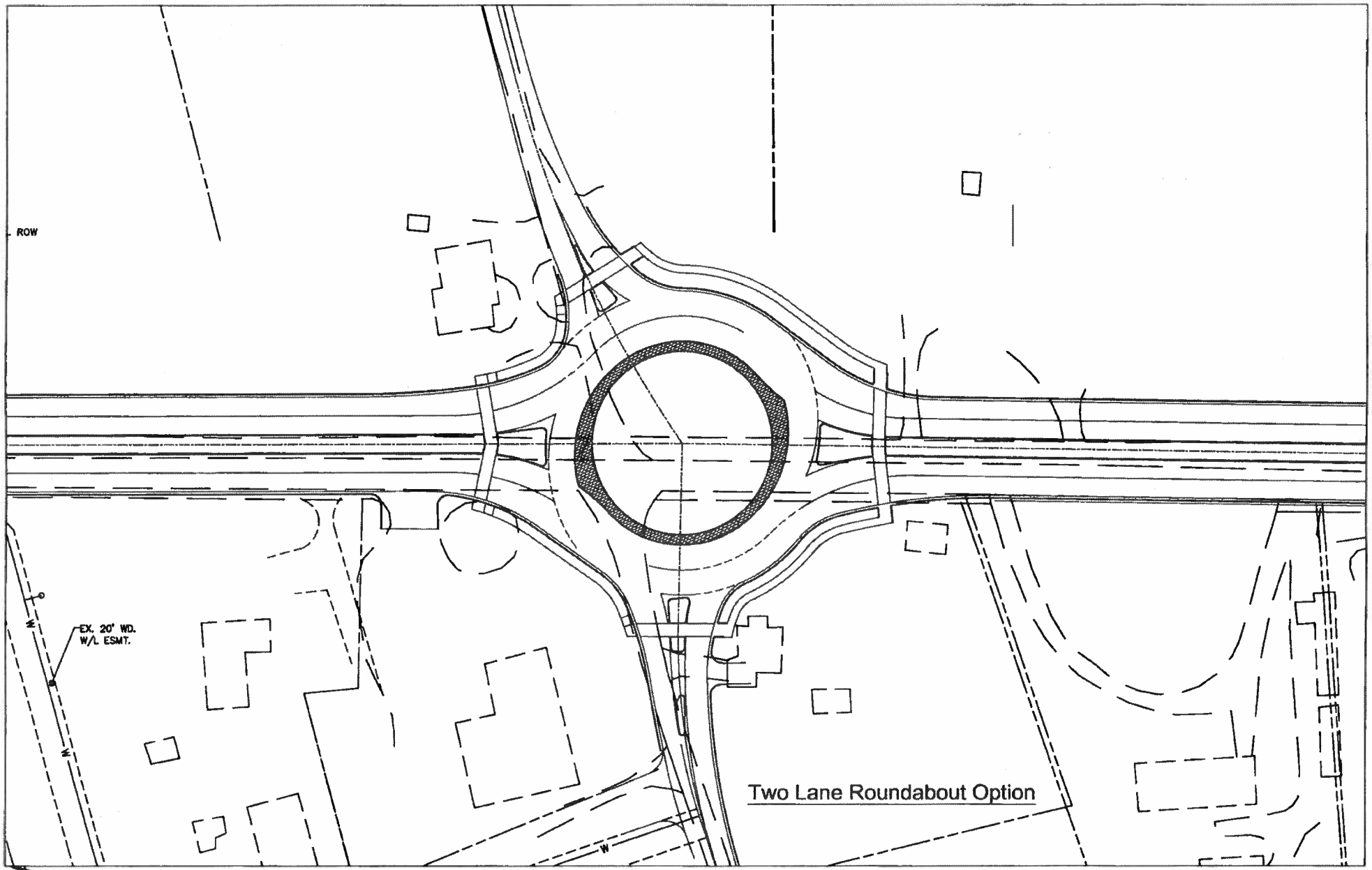


One Lane Roundabout Option

A-167



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